09-11-00 A

Case Docket No. PHN 17-637

COMMISSIONER FOR PATENTS, Washington, D.C. 20231

Enclosed for filing is the patent application of Inventor(s): PIETER JACOB SNIJDER, CAREL JAN LEENDERT AND ROBERT MARINUS HANENBERG

For: MULTIPLE ACCESS COMMUNICATION SYSTEM

ENCLOSED ARE:

[X] Associate Power of Attorney;
[X] Information Disclosure Statement, Form PTO-1449 and copies of documents listed therein;
[X] Preliminary Amendment;
[X] Specification (7 Pages of Specification, Claims, & Abstract);
[X] Declaration and Power of Attorney:
(2 Pages of a [ ]fully executed [X]unsigned Declaration);
[X] Drawing (2 sheets of [ ]informal [X]formal sheets);
[X] Certified copy of EUROPEAN application Serial No. 99202953.8;
[X] Other: CHARGE AUTHORIZATION ;
[ ] Assignment to .

FEE COMPUTATION

CLAIMS AS FILED				
FOR	NUMBER FILED	NUMBER EXTRA	RATE	BASIC FEE - 690.00
Total Claims	6 - 20 =	0	X $18 =	0.00
Independent Claims	1 - 3 =	0	X $78 =	0.00
Multiple Dependent Claims, if any			$260 =	0.00
TOTAL FILING FEE			=	$690.00

Please charge Deposit Account No. 14-1270 in the amount of the total filing fee indicated above, plus any deficiencies. The Commissioner is also hereby authorized to charge any other fees which may be required, except the issue fee, or credit any overpayment to Account No. 14-1270.

[ ]Amend the specification by inserting before the first line the sentence: --This is a continuation-in-part of application Serial No. , filed .--.

CERTIFICATE OF EXPRESS MAILING

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Atty. Docket

PIETER JACOB SNIJDER ET AL PHN 17,637

Serial No.

Filed: Concurrently

MULTIPLE ACCESS COMMUNICATION SYSTEM

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to calculation of the filing fee and examination, please amend the above-identified application as follows:

IN THE CLAIMS

Please amend claims 3, 5 and 6 as follows:

Claim 3, line 1, delete "or 2".

Claim 5, line 1, change "any one of the Claims" to --Claim--;
line 2, delete "to 4".

Claim 6, line 1, change "any one of the Claims" to --Claim--;
line 2, delete "to 5".

REMARKS

The claims are amended to remove multiple dependency without change in scope.

Entry is respectfully solicited.

Respectfully submitted,

By _____
Daniel J. Piotrowski, Reg. 42,079
Attorney
(914) 333-9624

Multiple access communication system.

The invention relates to a multiple access communication system comprising at least one primary station and a plurality of secondary stations, the primary station and the secondary stations being interconnected via a network, the secondary stations being arranged for transmitting return signals in a return signal frequency band to the primary station, the secondary stations being further arranged for transmitting the return signals in only a part of the return signal frequency band containing relatively little noise.

A multiple access communication system according to the preamble is known from the paper entitled "Channel modelling of the return channel in a broadband communication CATV network" as published in the Proceedings of the 28th European Microwave Conference, Amsterdam 1998, p. 517-522. An example of such a multiple access communication system is a bi-directional interactive cable TV (CATV) system, which can for instance be based upon a coaxial cable network or a hybrid fibre/coax network. Modern CATV systems can deliver a whole range of interactive services to the subscribers, such as interactive television, telephone and internet. The subscribers are able to transmit data to the primary station or head end by means of a return channel. This return channel is a frequency band which is reserved for the transmission of upstream signals (return signals). In European CATV systems the return channel lies between 5 MHz and 65 MHz, while in the US the return channel lies between 5 MHz and 42 MHz. A problem with the return channel is that it's performance is adversely effected by noise, mainly ingress noise and impulsive noise, which penetrates the CATV system. This noise, which is most prominently present in the frequency range between 5 MHz and 25 MHz, almost exclusively penetrates the CATV system in the subscriber's homes due to the relatively poor quality of the in-home part of the cable network (i.e. cables, splitters, connectors and couplers). Moreover, the noise originating from the subscriber's homes is added by the network so that a relatively high noise signal level is reached. This process of noise addition is sometimes referred to as noise funnelling.

In the known multiple access communication system the return signals are transmitted by the secondary stations in a part of the return signal frequency band which contains relatively little ingress noise, i.e. in the part of the return signal frequency band lying above approximately 15 MHz. In this way, the ingress noise doesn't severely interfere with the return signals. However, by doing so only a part of the return signal frequency band is available for the transmission of the return signals by the secondary stations and, consequently, a relatively small number of secondary stations can be supported by the known multiple access communication system.

An object of the invention is to provide a multiple access communication system, which supports a relatively high number of secondary stations and which prevents the noise from severely interfering with the return signals. This object is achieved in the multiple access communication system according to the invention, which is characterized in that the network comprises means for mapping the return signals onto the return signal frequency band. If only a $\frac{1}{n}$ part of the return channel band or return signal frequency band is used for the transmission of a set of return signals accommodating the return signal traffic of k secondary stations, deeper in the network, preferably in a place where less noise occurs, the entire return channel bandwidth can be exploited again by mapping n sets of return signals onto the full return signal frequency band so that the return signal traffic of nk secondary stations can be accommodated. This can best be illustrated by means of an example: let's assume that the full European return channel band of 5-65 MHz can accommodate the return signal traffic of 300 secondary stations. Furthermore, let's assume that, in order to prevent noise from interfering with the return signals, only the 45-65 MHz part of the return channel band is used by the secondary stations for the transmission of the return signals. Hence, only a $\frac{1}{3}$ part (20 MHz) of the full return channel band (60 MHz) is used for the transmission of the return signals. As a consequence, this limited bandwidth of 20 MHz can only accommodate the return signal traffic of 100 secondary stations, i.e. $\frac{1}{3}$ of the number of secondary stations accommodated by the full return channel band. The system is able to exploit the original capacity of 300 secondary stations by mapping three sets of 45-65 MHz return signals (each

set accommodating the return signal traffic of 100 secondary stations) onto the full return channel band of 5-65 MHz.

An embodiment of the multiple access communication system according to the invention is characterized in that the part of the return signal frequency band is an upper part of the return channel band, the means for mapping the return signals comprising a down converter for down converting the frequency of at least one of the return signals. If the upper part of the return channel band is used for the transmission of a set of return signals, a down converter can conveniently be used to map such a set of return signals onto a lower part of the return channel band so that this lower part of the return channel band can also be used for the transmission of return signals to the primary station.

The above object and features of the present invention will be more apparent from the following description of the preferred embodiments with reference to the drawings, wherein:

Figure 1 shows a block diagram of an embodiment of the multiple access communication system according to the invention,

Figure 2 shows a block diagram of an embodiment of the means for mapping the return signals onto the return signal frequency band.

In the Figures, identical parts are provided with the same reference numbers.

The multiple access communication system according to Fig. 1 is an interactive CATV system. A primary station or head end 2 is connected via a trunk network 4 to a local node 6, and to several other local nodes. An input/output of the local node 6 is connected with an input of a forward path amplifier 8 and to an output of a return path amplifier 10. The output of the forward path amplifier 8 and the input of the return path amplifier 10 are connected to a plurality of feeder cable sections 13, 14 and 15. The feeder cable section 14 is connected to an input of a forward path amplifier 12 and to an output of a return path amplifier 16. The output of the forward amplifier 12 and the input of the return path amplifier 16 is connected to drop cable sections 20, 22, and 24, which drop cable sections are connected to secondary stations 32, 34, and 36 which are located in the subscriber's homes.

The multiple access communication system according to Fig. 1 basically consists of three sections: the trunk network, the feeder network and the drop network. The

trunk network 4 is arranged for connecting the head end 2 to the local nodes. Optical fibre is often used in the trunk network 4, but also coaxial cable can be used in the trunk network 4. If the multiple access communication system has to serve a large area, the use of optical fibres in the trunk network can result in substantially lower costs.

Each local node is arranged for serving 100-1500 secondary stations. The forward path amplifier 8 and the return path amplifier 10 are arranged to have non overlapping pass bands in order to prevent instability. The output signal of the amplifier 8 is split into signals for the feeder cable sections 13, 14 and 15. The upstream or return signals from the feeder cable sections 13, 14 and 15 are combined to an input signal for the return path amplifier 10. The signal from feeder cable section 14 is amplified in the forward path amplifier 12, and distributed to the secondary stations 32, 34 and 36 via the drop cable sections 20, 22 and 24. The return signals from the secondary stations 32, 34 and 36 are transmitted via the drop cable sections 20, 22 and 24 and combined in means 40 for mapping the return signals onto the full return signal frequency band (e.g. 5-65 MHz), which means are located at the input of the return path amplifier 16.

In the subscriber's homes ingress and impulsive noise penetrates the CATV system. Only a part of the return signal frequency band, e.g. the frequency range between 45 and 65 MHz, is used by the secondary stations 32, 34 and 36 for the transmission of the return signals so that this noise, which is most prominently present in the frequency range between 5 and 25 MHz, cannot severely interfere with the return signals. In the means 40, which are located outside the subscriber's homes, the return signals (45-65 MHz) from the secondary stations 32, 34 and 36 are mapped onto the full return signal frequency band (5-65 MHz).

In general, the bandwidth of the part of the return signal frequency band used by the secondary stations to transmit the return signals in can accommodate a plurality k of secondary stations. In the means 40 several sets of k return signals are then mapped onto the full return signal frequency band.

Figure 2 shows an embodiment of the means 40 for mapping the return signals onto the return signal frequency band. The return signals (5-65 MHz) which are transmitted by the secondary station 32 via the drop cable section 20 to the means 40 are filtered in a high pass filter 42 (cut off frequency 45 MHz) in order to get rid of the noise in the lower part of the return signal frequency band. The high pass filtered signals 54 (45-65 MHz) are fed to a first input of an adder 52. The return signals (5-65 MHz) which are transmitted by the secondary station 34 via the drop cable section 22 to the means 40 are filtered in a band pass filter 44 (pass band between 45 and 65 MHz) in order to get rid of the noise in the lower part

of the return signal frequency band. The frequencies of the band pass filtered signals 56 (45-65 MHz) are down converted in a down converter 48 so that the therefrom resulting signals 58 have frequencies lying in the range between 25 and 45 MHz. These signals 58 are fed to a second input of the adder 52. The return signals (5-65 MHz) which are transmitted by the secondary station 36 via the drop cable section 24 to the means 40 are filtered in a band pass filter 46 (pass band between 45 and 65 MHz) in order to get rid of the noise in the lower part of the return signal frequency band. The frequencies of the band pass filtered signals 60 (45-65 MHz) are down converted in a down converter 48 so that the therefrom resulting signals 62 have frequencies lying in the range between 5 and 25 MHz. These signals 62 are fed to a third input of the adder 52. In the adder 52 the signals 54 (45-65 MHz), 58 (25-45 MHz) and 62 (5-25 MHz) are combined into a signal 64 having frequencies occupying the full return signal frequency band (5-65 MHz).

The scope of the invention is not limited to the embodiments explicitly disclosed. The invention is embodied in each new characteristic and each combination of characteristics. Any reference signs do not limit the scope of the claims. The word "comprising" does not exclude the presence of other elements or steps than those listed in a claim. Use of the word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements.

CLAIMS:

1. A multiple access communication system comprising at least one primary station (2) and a plurality of secondary stations (32, 34, 36), the primary station (2) and the secondary stations (32, 34, 36) being interconnected via a network, the secondary stations (32, 34, 36) being arranged for transmitting return signals in a return signal frequency band to the primary station (2), the secondary stations (32, 34, 36) being further arranged for transmitting the return signals in only a part of the return signal frequency band containing relatively little noise, characterized in that the network comprises means (40) for mapping the return signals onto the return signal frequency band.

2. A multiple access communication system according to Claim 1, characterized in that the means (40) for mapping the return signals are located in a part of the network where relatively little noise occurs.

3. A multiple access communication system according to Claim 1 or 2, characterized in that the part of the return signal frequency band is an upper part of the return channel band, the means (40) for mapping the return signals comprising a down converter (48, 50) for down converting the frequency of at least one of the return signals.

4. A multiple access communication system according to Claim 3, characterized in that the down converter (48, 50) comprises a block down converter.

5. A multiple access communication system according to any one of the Claims 1 to 4, characterized in that the network comprises a coaxial cable network.

6. A multiple access communication system according to any one of the Claims 1 to 5, characterized in that the network comprises a hybrid fiber/coax network.

ABSTRACT:

The multiple access communication system according to the invention comprises at least one primary station (2) and a plurality of secondary stations (32, 34, 36). The primary station (2) and the secondary stations (32, 34, 36) are interconnected via a network, e.g. a coaxial cable network or a hybrid fiber/coax network. The secondary stations (32, 34, 36) can transmit return signals in a return signal frequency band to the primary station (2). However, the secondary stations (32, 34, 36) are arranged for transmitting the return signals in only a part of the return signal frequency band containing relatively little noise, e.g. the upper part of the return signal frequency band. The network comprises means (40) for mapping the return signals of the secondary stations (32, 34, 36) onto the full return signal frequency band, e.g. by means of a frequency converter (48, 50). In this way, the communication system is much less sensitive to noise, while still the same number of secondary stations (32, 34, 36) can be handled by the communication system.

Fig. 1

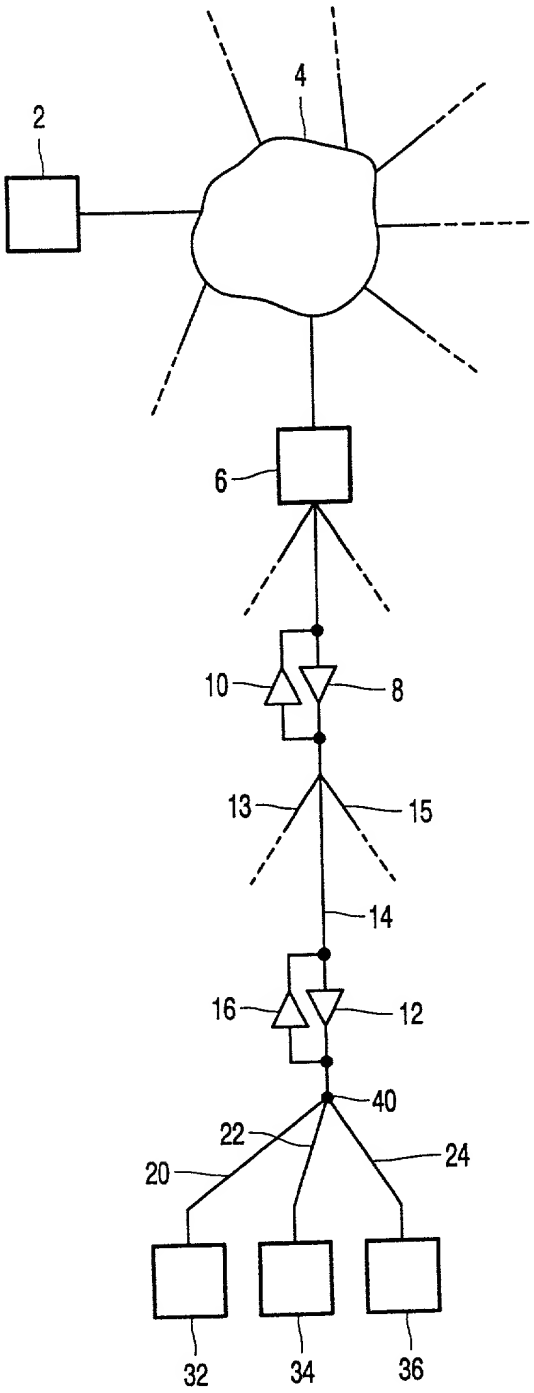

FIG. 1

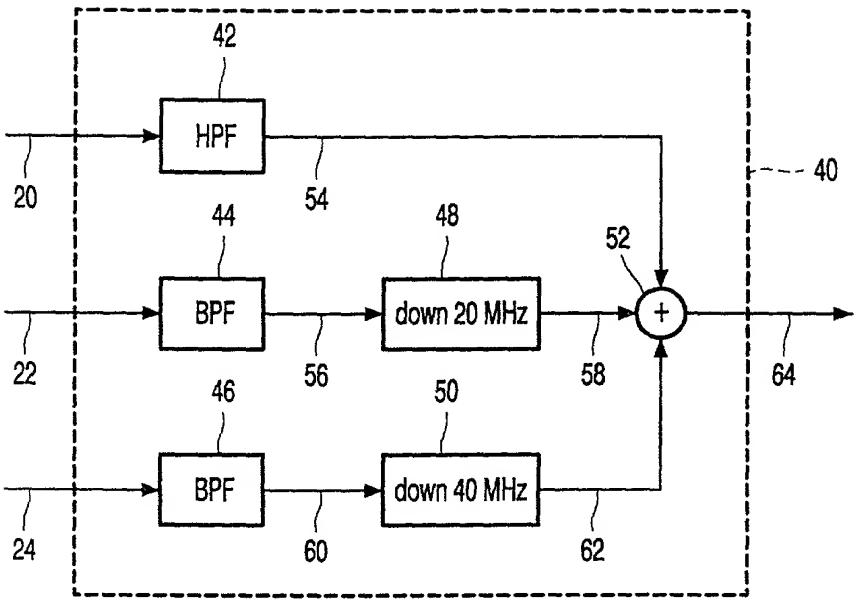
42
HPF
20
54
40
44
48
52
BPF
down 20 MHz
22
56
58
64
46
50
BPF
down 40 MHz
24
60
62

FIG. 2

DECLARATION and POWER OF ATTORNEY

ATTORNEY'S DOCKET NO.:
PHN 17.637 US

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **"Multiple access communication system"**

the specification of which (check one)

☐ is attached hereto.

☐ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by the amendment(s) referred to above.

I acknowledge the duty to disclose information which is material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

COUNTRY	APP. NUMBER	DATE OF FILING (DATE, MONTH, YEAR)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Europe	**99202953.8**	**10 September 1999**	**YES**

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1,56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

PRIOR UNITED STATES APPLICATION(S)

APPLICATION SERIAL NUMBER	FILING DATE	STATUS (PATENTED, PENDING, ABANDONED)

☐ I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Jack E. Haken, Reg. No. 26,902
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SEND CORRESPONDENCE TO: Corporate Patent Counsel; U.S. Philips Corporation; 580 white Plains Road; Tarrytown, NY 10591	DIRECT TELEPHONE CALLS TO: (name and telephone No.) (914) 332-0222

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Residence & Citizenship	City	State of Foreign Country	Country of Citizenship	
Post Office Address	Street	City	State of Country	Zip Code

Dated:		Inventor's Signature:		
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Residence & Citizenship	City	State of Foreign Country	Country of Citizenship	
Post Office Address	Street	City	State of Country	Zip Code

Dated:		Inventor's Signature:		
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Residence & Citizenship	City	State of Foreign Country	Country of Citizenship	
Post Office Address	Street	City	State of Country	Zip Code